

BEFORE THE  
**Federal Communications Commission**  
WASHINGTON, D.C.

ORIGINAL

In re: )  
 )  
Amendment of the Commission's Rules to )  
Establish Part 27, the Wireless )  
Communications Service ("WCS") )

GN Docket No. 96-228

To: The Commission

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**REPLY COMMENTS OF DIGIVOX CORPORATION**

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December 14, 1996

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### **Summary**

DigiVox Corporation (“DigiVox”) hereby submits its reply comments in the rulemaking proceeding regarding the Amendment of the Commission’s Rules to Establish Part 27, the Wireless Communications Service (“WCS”) in GN Docket No. 96-228. By its comments, DigiVox urges the Federal Communications Commission (the “Commission”) to adopt the following proposals in auctioning spectrum in the 2305-2320 and 2345-2360 MHz bands for use in providing Wireless Communications Service (“WCS”).

First, DigiVox proposes that the Commission apply the 45 MHz CMRS spectrum cap in awarding WCS Spectrum. DigiVox additionally proposes that the Commission adopt the out-of-band emission limits no more stringent than were proposed in its Notice of Proposed Rulemaking (“NPRM”) in this proceeding. DigiVox further proposes that the Commission decline to afford DARS providers preferential treatment in allocating the WCS spectrum. In addition, DigiVox proposes that the Commission decline to impose build-out requirements upon WCS auction winners. DigiVox also proposes that the Commission allocate the 2305-2320 and 2345-2360 MHz bands of spectrum by providing 10 MHz to each WCS licensee in paired blocks of 5 MHz as proposed in DigiVox’s opening comments. DigiVox further urges the Commission decline to reserve portions of the WCS spectrum for public safety use or otherwise restrict eligibility in the auction to only those bidders willing to accommodate public safety use, but instead give additional bidding credits to those who propose to accommodate public safety users. Finally, DigiVox proposes that the Commission decline to adopt special protections for amateur radio service providers and adopt its proposal to eliminate United States Footnote US253.

In the comments below, DigiVox elaborates upon its rationale for proposing the above measures.

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To: The Commission

**REPLY COMMENTS OF DIGIVOX CORPORATION**

DigiVox Corporation ("DigiVox") hereby submits its reply comments on the Notice of Proposed Rulemaking in GN Docket No. 96-228 regarding the Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service that was released by the Federal Communications Commission (the "Commission") on November 12, 1996.

**Discussion**

**I. The Commission Should Apply the 45 MHz CMRS Spectrum Cap in Awarding WCS Spectrum.**

The Commission should apply the 45 MHz CMRS spectrum cap in awarding WCS spectrum, and it should amend Section 20.6 of its rules to include WCS spectrum along with PCS, cellular and Specialized Mobile Radio ("SMR") spectrum in determining whether parties have reached the 45 MHz limit. Despite the contentions of AT&T Wireless Services, Inc. ("AT&T") and Vanguard Cellular Systems, Inc. ("Vanguard") that the goals of the spectrum cap have already been met, the cap remains necessary to enable small businesses and other designated entities to effectively compete for spectrum and to participate in the provision of

wireless services to the public. Furthermore, to adequately enable small businesses to compete effectively for WCS spectrum, the cap should be maintained at its current level of 45 MHz and should not be increased to 55 MHz as suggested by the Cellular Telecommunications Industry Association ("CTIA"). Without the aid of a spectrum cap, small business bidding credits, and a limit on the number of CMRS licenses for which any entity may take advantage of such bidding credits, small businesses as well as businesses owned by minorities and women will be precluded from acquiring CMRS licenses and from providing CMRS services to the public. Such a preclusion would be in direct contravention to Section 309(j) of the Communications Act, which directs the Commission ensure that small businesses and businesses owned by minorities and women are given the opportunity to participate in the provision of spectrum-based services. As a result, although some level of competition may exist in the CMRS marketplace, the fact remains that the Commission is statutorily required to facilitate the acquisition of spectrum by small businesses and businesses that are owned by minorities and women and to ensure that as diverse a group as possible receives licenses. By maintaining the 45 MHz CMRS spectrum cap, the Commission will help ensure that WCS spectrum will be used to provide competitive access services in competition with the local exchange telephone companies. There could be no greater rationale for maintaining the cap. Now is not the time to stop taking the medicine that is bringing the cure.

A number of commenters agree with DigiVox that special benefits for small businesses are absolutely necessary to enable small businesses to viably compete for spectrum in the WCS auction. Like DigiVox, these commenters realize that small business benefits are necessary not only to comply with the Commission's statutory obligation, but also to intensify the level of competition for WCS spectrum by allowing a greater number of parties the opportunity to

participate in the auction and diversify the pool of auction participants and ultimately the auction winners who will provide WCS service to the public. This increased competition will result in the most efficient use of WCS spectrum by ensuring that the spectrum falls in the hands of those parties who are most interested in serving the public, and not in warehousing the spectrum to forestall competition to existing services. Further, the increased competition as well as the diversification will result in more innovative applications of WCS spectrum in accord with the Congressional mandate contained in Section 309(j) of the Communications Act. Such action will serve the best interests of the public by providing it the services it most desires.

As demonstrated in the report of economist Ronald M. Harstad that was submitted as Exhibit 5 to the comments filed with the Commission in this proceeding by DigiVox on December 4, 1996, the failure to apply the 45 MHz spectrum caps to the WCS spectrum would result in the inefficient use of WCS spectrum. The failure to apply such caps will enhance the capacity of current players in the cellular/PCS market rather than promote the acquisition of spectrum by entities that are likely to use the WCS spectrum for innovative applications, such as low-tier PACS services. Dr. Harstad's study demonstrates that the allocation of WCS spectrum to such innovative providers will have a far greater impact on market concentration and will be more likely to increase competition than would the allocation of such spectrum to new PCS/cellular providers who intend to use the spectrum to enhance the PCS and cellular services already provided by them. Such low-tier services are not merely poised to provide further competition to current PCS and cellular providers. Rather, they are uniquely suited to provide competition to local exchange carriers in ways that PCS and cellular services are not. However, the failure to apply spectrum caps to the WCS auction could preclude the effective participation of such small businesses. While CTIA's HHI analysis seemed to support a higher cap of 55

MHz, its economic analysis neglected to consider the use of WCS spectrum by providers of service other than the traditional CMRS providers, which are not capable of introducing the levels of competition that could be provided by innovative, low-tier service. See Report for Reply Comments on WCS Auctions by Dr. Harstad attached hereto as Exhibit 1.

Further, those parties that are opposed to the use of the caps are for the most part those entities that have already reached the spectrum limits and are the very parties who hope to maintain their dominant positions in the wireless marketplace which would be strengthened by the failure to apply caps to WCS services. For example, to maintain the market dominance of its members in the wireless arena, CTIA opposed the initial allocation of spectrum for the use of PCS services. If the Commission had adopted CTIA's proposals with respect to PCS spectrum allocation, the PCS auction would never have occurred, and CTIA members would have succeeded in warding off competition in the provision of wireless services. CTIA now takes a similarly anti-competitive stance with regard to WCS spectrum allocation, and the Commission should not adopt the increased spectrum limits proposed by it, because that measure would do nothing more than protect members of CTIA from added competition in the marketplace. In addition, all RBOCs are also CTIA members who stand to benefit from forestalling competition to their local exchange businesses by WCS licensees.

For these reasons, the Commission should apply the 45 MHz spectrum cap as well as 25% and 40% bidding credits for small and very small businesses and a 98 CMRS license limit for which any entity may take advantage of small business bidding credits and other designated entity benefits. A further 5% bidding credit should apply to WCS bidders who do not control any CMRS spectrum in a given MTA.

**II. The Commission Should Adopt the Out-of-Band Emission Limits That Were Proposed in its NPRM.**

The Commission should adopt the out-of-band emission limits that were proposed in its NPRM. To protect satellite DARS providers at 2320-2345 MHz from interference, the Commission proposed that all emissions outside of the WCS bands be attenuated below the maximum power density ( $p$ ) within the band of operation, as follows:  $70 + 10\log(p)$  dB/MHz for fixed operations and  $43 + 10\log(p)$  dB/MHz for mobile operations where  $p$  is the maximum spectral power density. The Commission did not arrive at its 70 dB proposal by happenstance. Rather, the Commission carefully arrived at 70 dB because it determined that this limit would adequately protect DARS providers while allowing WCS providers in the 2305-2320 and 2345-2360 MHz bands to maximize their use of that spectrum.

The proposed 70 dB limit would require major alterations to equipment of entities hoping to provide service on the WCS spectrum. For example, adoption of the 70 dB limit would require low-tier PACS providers of service on the WCS spectrum to totally redesign their base stations from the ground up thereby increasing the costs of providing PACS service on that spectrum to the public. For low-tier services such as PACS, any cost increase is critical because such technologies are based on the distribution of thousands of base stations throughout a metropolitan area. Increasing the limit above 70 dB as proposed by the Digital Satellite Broadcasting Corporation ("DSBC") in its comments, or more particularly to 115 dB as proposed by American Mobile Radio Corporation ("AMRC") or even to 92 dB for the base and 123 dB for the mobile as proposed by Primosphere Limited Partnership ("Primosphere"), would even more dramatically alter the equipment design and further increase the manufacturing cost of such low-tier equipment, in some cases rendering the provision of such competitive services



cost-prohibitive thereby denying consumers the benefits of real competition to local exchange carriers that low-tier services are uniquely capable of providing. See letter from Hughes Network Systems attached hereto as Exhibit 2.

**III. The Commission Should Not Afford DARS Providers Preferential Treatment in Allocating the WCS Spectrum and Should Monitor the Proposed Use of That Spectrum by DARS Providers.**

The Commission should not afford DARS providers preferential treatment in allocating the WCS spectrum. Specifically, the Commission should decline to adopt Primosphere's proposal to process the applications of DARS applicants before processing the applications of other WCS spectrum bidders, especially if the entire 2310-2360 MHz band is considered for non-competitive DARS allocation as proposed by Primosphere. The Commission has proposed that spectrum be used to provide a variety of services, including fixed, mobile, radiolocation services or DARS, and it should maintain flexibility of use for the spectrum and should not favor DARS providers by allowing them primary consideration.

As suggested by both the Consumer Electronics Manufacturers Association ("CEMA") and the Satellite Industry Association ("SIA"), an organization commenting on behalf of the United States commercial satellite industry, perhaps the 2310-2360 MHz spectrum band is not even suitable for the provision of DARS services. CEMA asserts that it is unlikely that DARS would be technically feasible in bands shared with other primary uses, as would be the case with the spectrum at 2305-2320 and 2345-2360 MHz. According to CEMA, there are indications that the allocation of any "S-band" frequencies (the spectrum located between 2310-2360 MHz) for satellite DARS may not be technically optimal. CEMA further contends that if the S-band proves unsuitable to the provision of seamless coverage, an alternative spectrum band would be required to implement DARS in the United States.

SIA likewise proposed that the Commission look elsewhere for spectrum for use by DARS providers so that DARS providers could avoid having to compete against providers of other services or even other DARS providers, in auctions for spectrum space.

Notwithstanding the contentions of these commenters that the use of the 2305-2320 and 2345-2360 bands may not be the most suitable spectrum for use by DARS providers, the band may not even be legally used for the purposes for which some of the DARS providers intend to use portions of that spectrum. The MTA licensed service area and narrow 5 MHz spectrum blocks proposed by the Digital Satellite Broadcasting Corporation (“DSBC”), one of the DARS applicants, as well as the comments of the National Association of Broadcasters (“NAB”), indicate that DARS applicants are seeking to bid for spectrum for use as terrestrial repeaters to serve as “gap fillers” where their satellite feed is likely to encounter interference, particularly along the Canadian border. As the NAB points out, DARS providers intend to use WCS spectrum for the use of a complementary terrestrial service that would consist of a network of terrestrially, and not satellite, fed repeaters. However, such broadcast terrestrial radio service is not an application for which this spectrum is proposed to be allocated, and therefore, such use by DARS providers should be prohibited in the 2310-2320 MHz band.

#### **IV. The Commission Should Not Implement Build-Out Requirements for WCS Spectrum Winners.**

The Commission should adopt its initial proposal to not implement build-out requirements for WCS spectrum winners. DigiVox agrees with the assertion of the PACS Providers Forum (“PPF”) that such requirements are unnecessary and potentially harmful impediments to the most efficient construction of WCS systems. As PPF points out, the rationale for build-out requirements does not apply to the allocation of WCS spectrum.

Performance requirements, such as build-out requirements, are intended to prevent warehousing of spectrum and speed up service deployment. However, given the broad range of services that may be offered using WCS spectrum and the proposed use of competitive bidding to allocate WCS licenses, the licenses will end up in the hands of parties have paid for the licenses and who have every incentive to develop it in a speedy fashion thereby obviating the need for build-out requirements.

**V. The Commission Should Allocate the 2305-2320 and 2345-2360 MHz Bands of Spectrum by Providing 10 MHz to Each WCS Licensee in Paired Blocks of 5 MHz.**

The Commission should allocate the 2305-2320 and 2345-2360 MHz bands of spectrum by providing 10 MHz to each WCS licensee in paired blocks of 5 MHz. DigiVox supports the proposal of Bell Communications Research, Inc. ("Bell") to assign 10 MHz of spectrum in paired blocks of 5 MHz each to successful bidder in the WCS auction. DigiVox agrees with Bell that such an assignment will allow for the widest range of uses of the spectrum. In addition, such an assignment will foster a greater level of competition than would other divisions of spectrum.

Ten MHz in paired blocks of 5 MHz is required for PACS service to operate in the WCS spectrum. PACS service is uniquely poised to bring real competition to the local loop in ways that other services have not been able to provide. Any other method of assignment, such as the assignment of 15 MHz in unpaired blocks as proposed by DSC Communications Corporation ("DSC"), would preclude the provision of innovative and competitive applications of the WCS spectrum, such as PACS, on the WCS spectrum.

As DSC points out, the amount of spectrum included in the WCS bands is not adequate to support DSC's proposed service offering, which requires 70 MHz to operate. DSC currently has pending with the Commission a Petition for the allocation of radio spectrum for the provision of

wireless fixed access local loop (“WFA-LL”) services. DigiVox agrees with DSC that because it cannot support the spectrum requirements of WFA-LL services, the WCS spectrum band is not the appropriate band for use by providers of such services. As a result, DigiVox joins with DSC in proposing that the Commission process DSC’s Petition and look to the spectrum proposed therein to allocate for use by WFA-LL service providers. DigiVox opposes any division of the WCS spectrum into contiguous blocks of 15 MHz to accommodate DSC, because any use of the WCS bands for WFA-LL services would not be the most efficient use of that spectrum. See Statement of TSA Sites in DigiVox Comments (Exhibit 4).

**VI. The Commission Should Not Reserve Portions of this Spectrum for Public Safety Use or Otherwise Restrict Eligibility in the Auction to Only Those Bidders Willing to Accommodate Public Safety Use.**

The Commission should not set aside portions of WCS spectrum for public safety use or otherwise restrict eligibility in the auction to only those bidders willing to accommodate public safety use. The WCS frequencies will not handle the public safety spectrum requirements identified by the Public Safety Wireless Advisory Committee (“PSWAC”) in its Final Report to the Commission, and the PSWAC did not identify these frequencies as a potential solution to public safety spectrum requirements. The Association of Public-Safety Communications Officials-International, Inc. (“APCO”) made clear in its comments that, although the WCS spectrum band has some potential for meeting certain public safety spectrum needs, the band is not appropriate for most public safety communications operations, particularly mobile operations. Both APCO and Motorola Inc. (“Motorola”) showed that the cost of building a wide-area mobile system with in-building coverage could be as much as 17 times the cost of a

comparable system in the 800 MHz band and therefore would be cost-prohibitive for a public agency.

As a result, the Commission should focus on the 800 MHz band rather than the 2.3 GHz band in allocating spectrum for public safety use. As pointed out by Motorola, the 800 MHz band, particularly TV channels 60-69, not only is more affordable but also it has the advantage of close proximity to existing 800 MHz public safety bands, thereby enabling a greater degree of interoperability among public safety users.

However, if the Commission feels that special consideration at these frequencies is necessary for public safety, rather than setting aside spectrum for use solely by public safety providers or restricting auction eligibility to those bidders willing to accommodate public safety use in their spectrum, the Commission should encourage commercial WCS providers to make their spectrum available to public safety entities by providing bidding credits to those providers who commit to making their facilities available to public safety users on a wholesale basis. The bidding credits provided for such sharing should be in addition to the 25%, 40% and added 5% bidding credits that were proposed by DigiVox to be provided to small and very small business. The wholesaling of spectrum to public safety entities by WCS winners would be consistent with PSWAC's finding that a percentage of non-critical public safety emergency needs could be met by public safety entities using the facilities of CMRS licensees.

Some WCS applications, including low-tier applications such as PACS services, will be particularly well-suited to accommodate the special needs of public safety entities. In locating E911 emergency callers, for example, services employing low-tier microcellular networks, such as PACS, will immediately have the capability to pinpoint the location of emergency callers with a degree of accuracy that is up to 20 times greater in urban areas than will be available from

traditional high-tier providers such as PCS and cellular providers. This greater degree of accuracy results from the smaller cell sizes that are inherent in low-tier architectures. In adopting rules in this proceeding, the Commission should consider the utility of low-tier services in meeting the Commission's CMRS public safety goals and adopt rules that facilitate the participation of such low-tier services in the WCS spectrum.

**VII. The Commission Should Not Adopt Special Protections for Amateur Radio Service Providers and Should Adopt Its Proposal to Eliminate United States Footnote US253.**

The Commission should not adopt special protections for amateur radio service providers and should adopt its proposal to eliminate United States footnote US253. Any special protections afforded to amateur users will result in an inefficient use of the spectrum and would devalue the WCS spectrum, in some cases making the spectrum effectively useless for some WCS applications. As a result, such protections will bring down the value of licenses and consequently the amount of revenue generated by the auctions.

**Conclusion**

Accordingly, DigiVox Corporation respectfully urges the Commission to adopt its proposals for the auction of the WCS spectrum identified in its November 12, 1996 Notice of Proposed Rulemaking.

Respectfully submitted,

**DIGIVOX CORPORATION**

By: 

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Dated: December 16, 1996

## EXHIBIT 1



## Report for Reply Comments on WCS Auctions

Ronald M. Harstad, Ph.D.

1. The arguments that AT&T and CTIA make for raising or removing the 45 MHz spectrum cap are disingenuous. *They offer no clear reason why a CMRS incumbent would need additional CMRS capacity.* This is not surprising: such reasons are hard to find. The market share which can be served within the 45 MHz cap is already so sizable as to grant a firm which is fully using 45 MHz a substantial degree of market power. Even optimistic projections of total CMRS market penetration through 2005, based on the suspicious assumption of no further advances in digital compression technology between now and then, suggest that the entire CMRS market can be served with a total industry capacity of 100-120 MHz. Even if there were 9 or 10 firms holding spectrum capacity and offering CMRS services in a market, one firm's market share would have to approach 50% for it to need more than 45 MHz. Such a dominant firm is able, and has every incentive, to engage in anti-competitive tactics.

The Herfindahl-Hirschman Index (HHI) was created as a tool to offer a simple, single-number summary of market concentration *based on sales*. Arguments basing an HHI calculation on spectrum capacity ought only be considered when no better data than capacity are available. Such arguments amount to an assumption that all firms in the CMRS market are exactly equally efficient in their use of spectrum, in particular that brand recognition and first-mover advantages play no role whatsoever in allowing some firms to acquire a larger share of customers than their share of spectrum capacity.

Of course, that is wildly at odds with the facts. Consider a firm holding a 30 MHz PCS licenses covering the same geographic area as a cellular licensee holding 25 MHz. The PCS firm has 64% more effective capacity. If the cellular firm has no first-mover advantage, then capital markets ought to evaluate the PCS firm 64% higher. Quite the reverse is true.<sup>1</sup>

The loosely illustrative capacity-based HHI calculations which were included in appendices to my report submitted for the original WCS comments, and also to the CTIA comments, considered changes in market structure that kept HHI's in

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<sup>1</sup> Based upon market transactions that included many occurring after it became clear that the FCC would privatize an additional 120 MHz of spectrum (to become the A-F blocks), estimates of the nationwide value of the 50 MHz of cellular spectrum over the period 1991-93 (including estimates by NTIA) ranged from \$40 billion to \$100 billion. Contrast this with the \$7.7 billion (for 60 MHz) which the A/B block auction raised.

the 1,400-1,900 range. However, evidence that a single CMRS provider needed more than 45 MHz capacity to serve its customers would make these capacity-based calculations irrelevant, and would imply that the HHI is somewhere in the 2,500 range or higher.

It is natural that AT&T and CTIA want the 45 MHz spectrum cap lifted. Their incumbent CMRS businesses can attain further supra-competitive profits if they are allowed to obtain further spectrum for warehousing; a compelling case for the presumption of warehousing intent and consequent anti-competitive impact was made in my initial report. Moreover, a small firm acquiring a WCS license may choose to enter a CMRS market with 190-210 MHz capacity if no one incumbent holds more than 45 MHz of that capacity, but may be convinced to stay out of the CMRS market by the presence of a behemoth incumbent holding enough capacity to serve 50-60% of the market all by itself.

Bear in mind that warehousing is sharply contrary to all four Congressionally mandated objectives, as I explained in my original comments.

It is also the case that a CMRS entrant bringing a low-tier microcellular technology may be able, through judicious cost management, to have a pro-competitive effect on prices well beyond the impact that its eventual market share would imply. When the only purpose for raising or removing the spectrum cap is to allow warehousing, why should CMRS consumers be denied these more competitive prices?

AT&T claims, without any supporting evidence, that "counting [CMRS] use against the spectrum cap would plainly be inefficient and unnecessary." The evidence, we have seen, is to the contrary: the plainly inefficient use of spectrum is warehousing, and it is necessary to retain the spectrum cap as one part of fighting against that plain inefficiency.

2. AT&T suggests that CMRS markets are already competitive, and suggests FCC rule changes that will decrease their competitiveness. It is, again, wholly understandable why they want that statement to be accepted as if it were a fact. But the case for it is far less clear.

A WCS licensee that is not a CMRS incumbent can compare the economic viability of alternative uses of WCS to that of entering the CMRS market. If it turns out that CMRS entry is the most profitable alternative, then a clear sense is shown in which the CMRS market needs to become more competitive. If the FCC does not put up artificial barriers to entry, and does what it can to discourage anti-competitive warehousing, then *the appropriate degree of competitiveness of the*

*CMRS market arrives when a potential entrant chooses to take its spectrum elsewhere, but not before.* Raising the spectrum cap amounts to substituting the lobbying of incumbents for the judgment of the market.

3. Claims by AT&T and CTIA that incumbents need much more spectrum to take advantage of economies of scale and scope withstand no scrutiny. They can provide no sensible examples of such economies that would be frustrated by the sensible retention of the spectrum cap. AT&T's claim that "CMRS providers have considerable experience in the wireless industry and their existing facilities and technical knowledge could speed innovative service to the public" is merely self-serving. This claim flies in the face of our experiences in all high-tech industries: small, start-up firms generate the innovations, large incumbent firms attempt to expropriate and vitiate innovations. Existing facilities typically yield huge incentives to delay, not to speed, innovation.

CTIA's lone example of an economy of scope remaining unrealized is facilitating "the transition from analog to digital by enabling the use of dual band CPR." A cellular incumbent who cannot attain such an economy well within 45 MHz capacity must have an enormous sales-based market share. CTIA claims that CMRS providers could offer services such as wireless Internet capabilities with 55, but not with 45, MHz. There is no basis for the claim that 45 MHz is not enough, unless the firm has a dominant market share. Even if 45 MHz were not enough, it assumes that services CMRS offer to customers are limited to services based solely on the firm's own facilities and using solely the spectrum directly licensed to the firm. We seem to recall many CTIA members announcing a wide variety of cross-licensing agreements, and some advertising "one-stop shopping" to customers in regions where their only access to the local loop is via licensing agreements.

**EXHIBIT 2**

December 16, 1996

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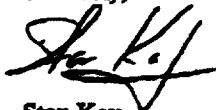
Dear John:

It is proposed that PACS wireless communications equipment be deployed in the WCS spectrum - 2305 to 2320 and 2345 to 2360 MHz. Existing applicants in the adjacent 2320 - 2345 MHz spectrum, namely DARS (Digital Audio Radio Services), object on the basis that out-of-band emissions will disrupt their receivers.

Primosphere, in its filing, proposes an increase on out-of-band emission limits from 70 dBc for base stations and 43 dBc for mobile stations to 92 dBc for base stations and 123 dBc for mobile stations on the basis that this is readily achieved through filtering. However, the offset from the carrier is not defined and this is necessary to design realistic equipment. Transmit emissions result from a combination of filtering at the modulator and linearity in the power amplifier and requires designing the power amplifier with sufficient back-off from the one dB gain compression point,  $P_{1dB}$ .

Currently, the PACS transmitters are operated at 1-2 dB back off, to meet an adjacent channel suppression at +/- 600 kHz from the carrier of roughly 50 dBc. The power amplifier design would have to significantly change to meet 92 dBc or even 70 dBc at 600 kHz offset - filtering is of little use, the PA back-off would have to increase substantially. This means increasing the power amplifier linearity by dissipating more DC power. Although HNS is not manufacturing PACS handsets, we recognize that the effect on battery size to meet 123 dBc would be prohibitive.

Sincerely,



Stan Kay  
Assistant Vice-President, Engineering